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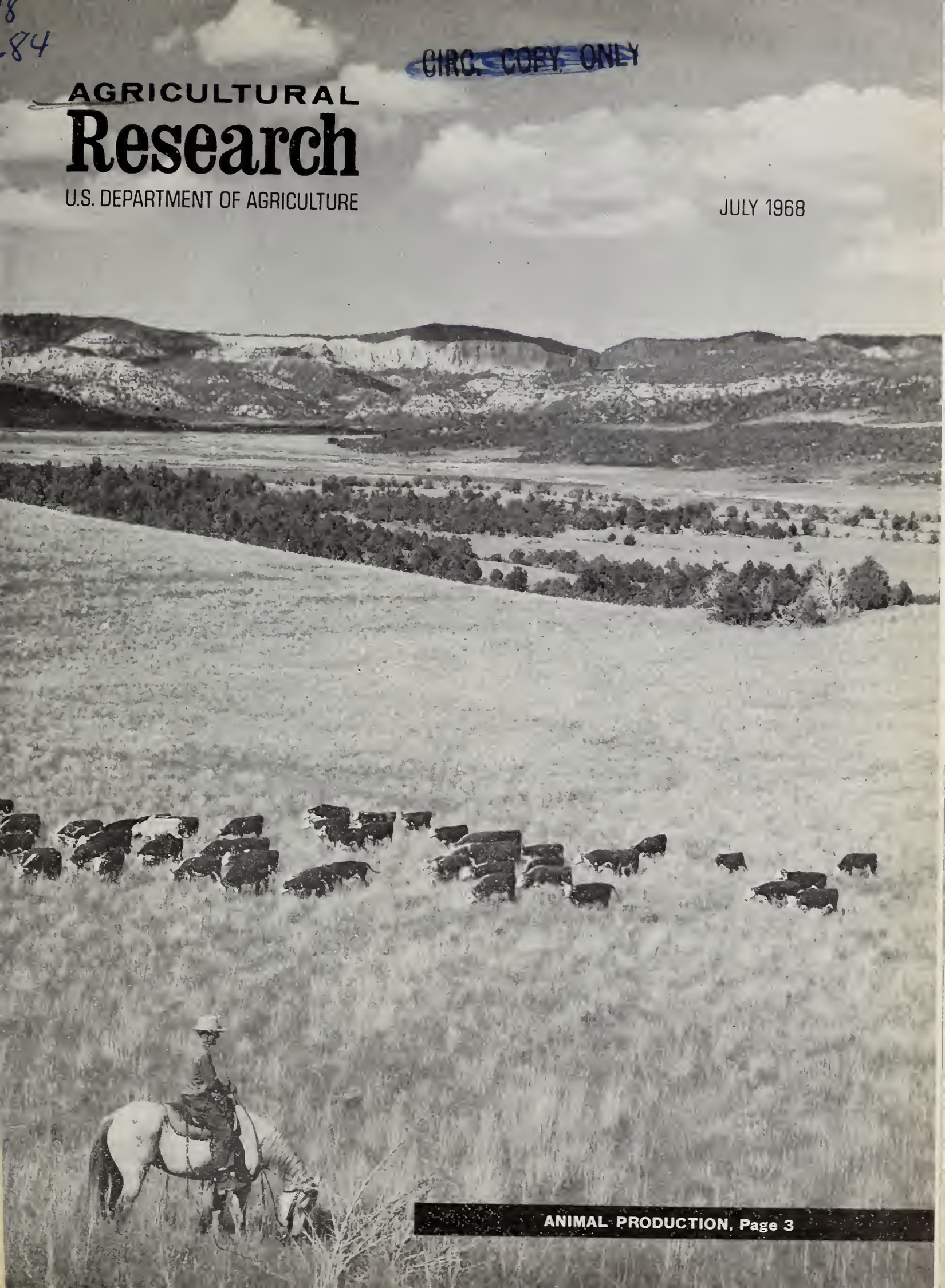

ANIMAL PRODUCTION, Page 3

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Meat on Tomorrow's Menus?

The bleak gastronomical picture of meatless meals, often forecast in the press is not about to happen. Animal production scientists point out that livestock can thrive on roughages and wastes, including some we have not begun to exploit like feathers and newspapers. In addition, much of the world's marginal land that cannot grow crops can support livestock. And most important, future research will outstrip the considerable achievements of the past.

As part of international research efforts to improve livestock efficiency, the Second World Conference on Animal Production will meet July 14–20 at the University of Maryland, College Park. The conference theme: "The role of animal science in meeting world food needs." ARS is one of the sponsoring organizations, and our scientists will conduct research bearing on keynote topics, including:

- Improving livestock through breeding for higher production, better quality, and a more beneficial adaptation of the animal to his environment.
- Increasing reproductive efficiency. Too many brood animals fail to come in heat, fail to conceive, abort with embryonic deaths, have stillbirths, or lose their offspring in postnatal deaths.
- Improving feeds and feeding techniques. Scientists will determine exact nutritional requirements and develop more accurate feed evaluation methods to eliminate waste while ensuring rapid, efficient growth. They will also seek ways to utilize waste materials and processing byproducts as feeds. Other study areas include growth stimulants, feed additives, and lactation stimulants.
- Improving livestock facilities. Extremes in temperature, humidity, and air movement reduce production, throw animals off feed, lower resistance to disease and cause death.
- Improving animal products. We need to know what livestock product qualities consumers want and tailor production to these preferences. By developing new and improved processed meat, milk and egg products we can reduce costs, improve quality and extend variety.

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Orville L. Freeman, Secretary
U.S. Department of Agriculture

G. W. Irving, Jr., Administrator
Agricultural Research Service

Cold chicks huddle for warmth. Those on edge of group jump over others to get into the middle, thus all benefit from huddling (PN–1645).

Chicks prove unexpectedly rugged

. . . when BROODER POWER FAILS

POWER FAILURES AND sudden temperature drops may not be as hazardous to broiler chicks as is commonly believed.

Scientists exposed broiler chicks 1 to 8 days old to temperatures as low as 25° F. for short periods. This did not cause growth retardation, mortality, or condemnation at the processing plant.

The cold did not adversely affect chicks, whether they were exposed singly or in small groups, gradually or suddenly. ARS poultry scientists J. W. Deaton, F. N. Reece, and T. H. Vardaman conducted these tests at the South Central Poultry Research Laboratory, State College, Miss.

The researchers wanted to find out what happens when the gas or electricity in the broilerhouse fails. Poultrymen have long thought that keeping young chicks at a temperature between 80° and 95° F. was vital to successful broiler production.

In 14 trials, researchers tried different ways of stressing chickens with low temperatures. In one trial, temperature in a cold chamber was allowed to drop gradually from 95° to 40° F. one, two, or three times in a 12-hour period during a flock's first week of life.

In one variation of this trial the scientists stressed another group of 1-day-old chicks even more severely by dropping the temperature from 95° to 40° F., then in-

Miniature radio attached to chick reacts to warmth by sending out short bursts of energy, or clicks, that come faster as temperature falls. Automatic equipment times and converts clicks to temperature readings (PN–1646).

creased the temperature from 95° to 125° F. when they were 3 days old. In a second variation, both temperature-stressed and experimental control groups of 1-day-old chicks were exposed to the organism which causes chronic respiratory disease.

All cold-stressed flocks produced as well as control flocks. The birds averaged close to 3 pounds when marketed at 8 weeks and had about equal mortality and condemnation. With the added stress of chronic respiratory disease infection, mortality and condemnation went up considerably and body weight at 8 weeks dropped somewhat. However, the cold-stressed chickens sustained no greater damage than birds reared continuously at the normal temperature.

In another series of tests, chicks were exposed to low temperature in groups of 45; this permitted them to huddle together for warmth. The huddling instinct paid off. Air temperature between huddling chicks was 101° F., even when the room temperature dropped to 40° F.

The researchers also exposed chicks suddenly one by one to 40° F. to deprive them of the advantages of both gradual heat reduction and huddling. Each chick's body temperature was monitored with a thermometer hooked to a miniature radio transmitter.

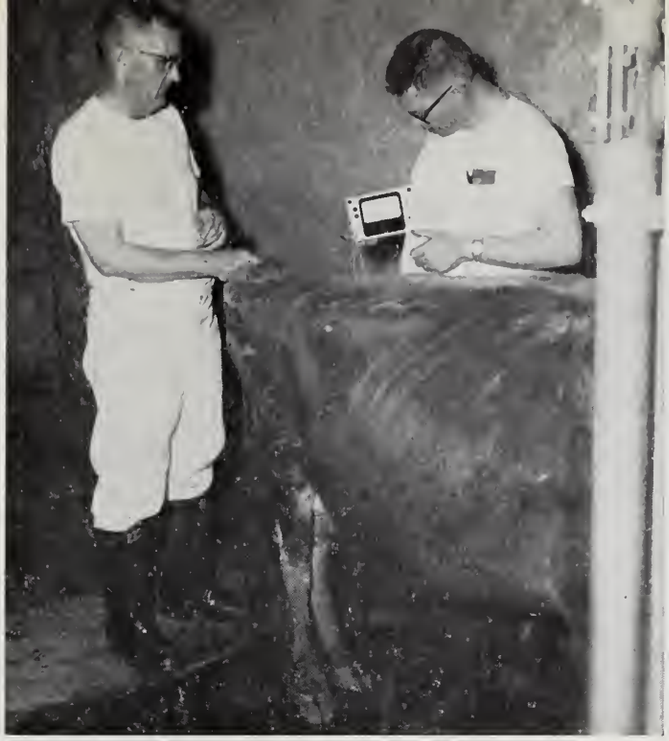
Normal body temperature of chicks during their first week of life averages about 104° F. Exposure of 1-day-old chicks to 40° F. for about 4 hours dropped body temperatures to a range of 60° to 89° F.

As an ultimate test, individual chicks under a week old were held at 25° F. until they slipped into a cold-induced coma. Comatose chickens recovered without special treatment after being returned to normal heat. After 3 hours, researchers could not distinguish between cold-stressed chickens and those normally reared. These chicks did as well as the controls during rearing and marketing.

Despite these findings, the researchers emphasize that proper heating in the broilerhouse should not be neglected, especially with large flocks. When exposed to low temperature for long periods, chicks in large flocks will pile on top of each other and suffocate.

The scientists also point out that conditions other than cold were strictly controlled in the experimental broilerhouses. They plan future experiments to explore whether cold worsens the effects of other unfavorable environmental conditions.

Chicks usually slip into a cold-induced coma when body temperature drops to 80° F. They suffer no ill effects. When body temperature drops below 60° F., however, most chicks die (PN–1647).



A. B. Larsen and R. S. Merkal run clinical test on cow stricken with paratuberculosis (PN–1648).

FOUND: a test for PARATUBERCULOSIS

A NEW AND ACCURATE diagnostic test may finally enable cattlemen to rid their herds of paratuberculosis.

Also known as Johne's disease, paratuberculosis is one of our most costly chronic diseases of cattle. It is a bacterial infection of the intestines that causes persistent diarrhea and a rapid loss of weight.

Paratuberculosis has plagued U.S. herds since 1908. It seldom causes widespread alarm because only a few cows in a herd show symptoms at any one time. But the outcome, almost invariably, is either early slaughter or death. There is no known effective treatment for infected cattle.

ARS bacteriologist R. S. Merkal and research veterinarian A. B. Larsen of the National Animal Disease Laboratory, Ames, Iowa, developed the basis for the new test a few years ago by improving the method of culturing paratuberculosis bacillus in the laboratory. These improvements included a better way to decontaminate specimens and a special growth-promoting material that is more readily available to the organism.

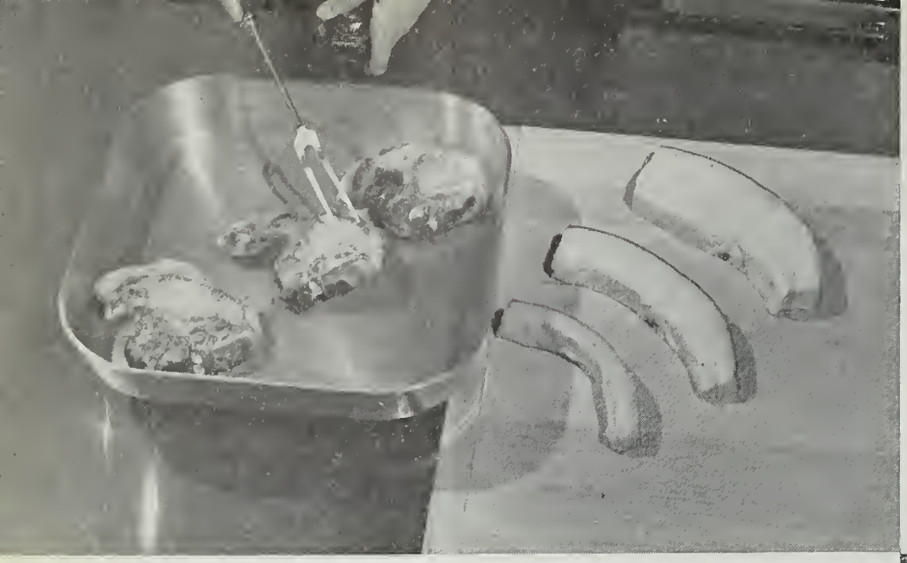
To test the improved laboratory culture method as a screening technique, the scientists selected 370 cows likely to be culled soon for low production, infertility, old age, or paratuberculosis. The cows were part of a large dairy herd with a history of paratuberculosis infection. In 3 years of testing, the cultural examination correctly identified 36 cows as infected carriers 1 to 2½ years before they showed symptoms of paratuberculosis.

The best previously available test for detecting paratuberculosis in cattle involved measuring the swelling of skin in response to an injected extract prepared from killed paratuberculosis bacilli. When used on the same 370 test cows, the skin test detected only eight of the carriers that later showed symptoms of paratuberculosis.

A vaccine exists but is not useful for cattle. It sometimes causes a positive reaction to the skin test for tuberculosis, and, by law, such reactors must be destroyed.

The diagnostic test developed by Merkal and Larsen will fit right into a practical control program. Screening and culling out carriers, coupled with good management—the best procedure for fighting the diseases—had been hampered in the past by lack of a dependable diagnostic test. The new test fills this gap.

The researchers recommend screening infected herds with the test at least twice a year. Carriers should be slaughtered immediately for three reasons: First, they will probably die of paratuberculosis anyway. Second, cattle bring a higher price if sold before showing disease symptoms. Meat quality is not affected. Third, and most important, the rest of the herd is much less likely to become infected if carriers are eliminated early.■



Fried loin chops from three experimental lines of Durocs shown along with fat trimmings (ST–3536–11).

Meat cutter E. M. Grube saws loin chops from low-fat, unselected, and high-fat lines of Duroc hogs (ST–3537–13).

Should Hog Producers BREED LEAN or FEED LEAN?

GENETICALLY LEAN HOGS produce more lean meat than genetically fat ones, regardless of whether high- or low-energy diets are fed.

This finding that "breeding lean" is better than "feeding lean" could help hog producers avoid the extra labor involved in a limited feeding operation. And the lean pork chops that consumers prefer may become more plentiful.

To study the effect of differences in both breeding and feeding on the quality of meat, ARS swine researchers R. J. Davey, D. P. Morgan and C. M. Kincaid at Beltsville, Maryland, selected Duroc and Yorkshire hogs for both high or low backfat thickness as described on page 7.

Hogs from each line were assigned to two groups. One received a full feed; the other, a diet restricted to 75 percent of the energy in a full feed. Protein intake in all groups was about equal.

Results with the high- and low-fat Yorkshire lines exemplify the trial's overall results. Hogs from the low-fat line produced 66 pounds of lean meat when full-fed, and 59 pounds of lean when fed a limited ration.

In contrast, the high-fat line produced 52 pounds of lean on full feed, and 55 pounds on limited feed. Average slaughter weight of hog groups on test was 195 pounds.

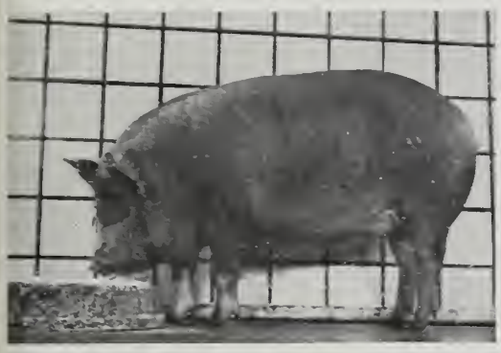
Besides yielding more lean meat, the full-fed, genetically lean hogs grew faster than the other groups on test. This is of economic importance to producers because limited feeding tends to slow down growth rate.

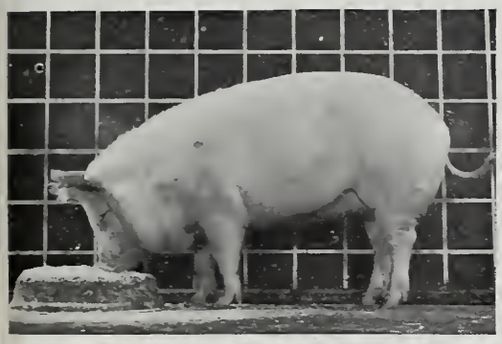
Daily gains from weaning to slaughter were 1.41 pounds for genetically lean hogs on full feed; 1.19 pounds for genetically lean hogs on limited feed; 1.33 pounds for genetically fat hogs on full feed; and 1.09 pounds for genetically fat hogs on limited feed. Feed efficiency was substantially the same for the four groups.

A taste panel rated the flavor of the meat produced by full-fed hogs and by hogs on restricted feed as essentially the same, whether the hogs were from high-fat or low-fat lines.■

H. O. Hetzer takes a backfat reading on low-fat Duroc hog. Lean meter measures fat thickness through an electric impulse (PN–1649).

Top: Conformation of high- and low-fat Durocs (ST–3529–4 and ST–3529–9). Below: High- and low-fat Yorkshires (ST–3529–13 and ST–3529–15).





Breeding Hogs for

MORE LEAN PORK

MORE LEAN MEAT CAN be bred into pigs—even after 12 generations of selecting for inborn leanness.

This genetic potential of pigs to meet the needs of modern consumers is being demonstrated at Beltsville, Md., with six closed lines of swine established in 1954.

Geneticist H. O. Hetzer is testing Durocs, a relatively fat breed, and Yorkshires, basically a leaner breed. In one line of each breed, Hetzer selects pigs with the least backfat at 175 pounds of body weight to become parents of each successive generation. A second line is consistently selected in the opposite direction—*most* backfat at 175 pounds—to broaden the perspective on the genetics involved in determining fatness. A third line in each breed is unselected; it serves as a check on progress made in the other two.

After 12 generations, unselected Durocs average 1.53 inches of backfat, still close to the breed average. The low-fat line averages 1.11 inches, and the high-fat line, 2.34 inches.

Backfat thickness for the Yorkshires, now in the 10th generation, is 1.24 inches for the unselected line, and 0.97 inch and 1.75 inches for the low- and high-fat lines.

To the consumer, increased leanness through selective breeding means bigger, leaner loins and hams. For example, the area of lean meat in loin chops from low-fat Yorkshires averages 4.84 square inches, compared to the unselected line's 3.84 square inches. Loin chops from high-fat Yorkshires average only 3.47 square inches.

A Yorkshire ham from the low-fat line has about 2 pounds more lean meat than one from the unselected line. High-fat Yorkshires had 0.9 pound less lean meat per ham than the unselected line.

Although responses to selection have decreased somewhat in recent generations, progress is still being made toward both leanness and fatness. Hetzer plans to continue his tests to get the best possible picture of all genetic elements involved.

The two lean lines may be getting close to the consumers' ideal. Recently, taste panels have started scoring meat from the latest lines of lean pigs slightly lower on tenderness, juiciness, and general desirability than meat from fatter pigs. ■

ARS dairy researcher R. H. Miller scrutinizes DHIA records in studies that led to new repeatability estimate for herd sires (ST–3614–17).

A 'confidence indicator' helps DHIA members select

Moneymaking sires

DISTINGUISHING A SUPERIOR dairy bull from a mediocre one is easier than ever thanks to repeatability estimates now provided with sire evaluations.

These "confidence indicators," developed by ARS researchers, foretell how accurately the sire evaluation, or summary, can predict the performance of a bull's future progeny.

Research shows that sire summaries are valuable; dairymen who use them effectively may potentially increase income by $20 per cow or more.

Prepared by ARS scientists from data collected by the Dairy Herd Improvement Association (DHIA), the sire summaries indicate the likelihood of a bull siring daughters with a certain level of milk production. The summary is a composite rating of daughters already sired by a particular bull; it compares their milk production with that of other bulls' daughters in the same herd.

Mathematically, however, two bulls may have the same numerical sire summary even if one has daughters with more extensive and meaningful records.

This is so, first, because cows in the herd to which a bull's daughter is compared may all be daughters of a few unrepresentative bulls with genetic capacity above or below the breed average. Furthermore, daughters in a single herd seem to perform more similarly than do daughters distributed over several herds, because cows of a herd are managed and housed alike. Thus, records on bulls increase in value as their daughters are more dispersed. Five daughters in separate herds, for example, provide data for sire summaries as valuable as 20 daughters in one herd.

Secondly, cows can better express their true genetic milk producing ability as the number of their yearly production records increases. ARS calculations show that a cow with three records should be rated 50 percent higher in the sire summary than a cow with a single record.

The repeatability estimate, when applied to a bull with records including extensive and varied information, will indicate with near certainty that future progeny will be as good as the summary predicts. For a young bull, the new information gives odds on whether his future progeny will be better or worse than the summary predicts.

The value of sire summaries to dairymen was shown by computing the production records of 182 cows in the Beltsville herd, using average U.S. milk prices for 1966. When DHIA records predicted that a bull would sire daughters producing 100 pounds above the breed average, use of that bull returned $3.22 per daughter in extra profits, expressed as income above feed costs.

Bulls in the Nation's artificial insemination program have an average predicted advantage of 151 pounds of extra milk in their daughters' production—a profit advantage of $4.86. Dairymen can do even better by restricting semen collection to bulls with daughters predicted to yield at least 400 pounds of milk above breed average. In this case, extra profits would amount to $21.80 per cow at 1966 prices, with accrued profits to the U.S. dairy industry of $141.7 million.

ARS dairy researchers F. N. Dickinson and B. T. McDaniel, who directed this study, say that there are enough +400-pound bulls available today to meet the needs of almost any dairyman who requests them. They add that a dairyman who spends 3 hours per year on a record search can readily identify +400-pound bulls that suit his other prerequisites.■

Hope takes test sample from collection cup of direct-flow milking system (ST–3610–13).

R. F. Hope, DHIA supervisor, Frederick County, Md., eartags a 3-week-old calf. The tag number stays in her record. Each new record makes a sire summary that much more meaningful (ST–3610–20).

Calipers and magnifier speed job of reading results of Babcock test for butterfat (ST–3611–3).

A lamb crop every 8 months is close to commercial reality. This ewe produced two sets of lambs, one in March, one in November (BN–32092).

TWO LAMB CROPS A YEAR

LAMBS, NORMALLY BORN only in the spring, come both spring and fall in an experimental breeding flock at Dubois, Idaho.

Several types of exploratory hormone treatments given to 150 ewes nursing their first lamb crop turned the trick. The best hormone treatment induced nearly half of the ewes to lamb out of season.

But ARS physiologist C. V. Hulet, who directs the Dubois project, cautions that hormone treatments for twice-a-year lambing are still in the early exploratory stage, and must be refined before they can be recommended to the sheep industry.

In 1967, the Dubois ewes were put on several variations of a hormone treatment 7 to 17 days after delivering their usual spring crop of about 150 lambs per 100 ewes. Treatments brought 130 ewes, or 87 percent of the flock, into heat 27 to 40 days after they had given birth. After being mated, 32 ewes tested pregnant in early September; they were separated from the flock and provided grain for extra energy.

In October and November, a total of 43 lambs were born alive—a rate of about 29 lambs per 100 ewes bred. The ewes produced adequate milk to raise these lambs and the young ones grew at a normal rate.

All but three of the 32 ewes were retained in the experimental flock and rebred immediately after delivering fall lambs. In April and May 1968, they produced another crop of spring lambs. Hulet then started a second round of improved hormone treatments, and he expects his second out-of-season lamb crop to be born in the fall of 1968.

In earlier trials, Hulet achieved up to 100 lambs per 100 ewes bred out of season, but these ewes were not kept on a tight twice-a-year lambing schedule. Hulet thinks the reduced lamb crop on the tight schedule was caused by an improper hormone balance and by rebreeding ewes that had very recently given birth, not by any "extra strain."

On the whole, experience with out-of-season lambing was quite good in 1967, Hulet says, especially in terms of ewes coming into heat.

Although the gestation period in sheep is just under 5 months, two yearly lamb crops are extremely rare in nature. Most ewes mate only during late summer and autumn and are not physiologically prepared to start a new pregnancy in spring because hormones that stimulate ovulation and mating are not secreted in proper amounts.

In 1945, physiologists first showed that injections of ovulating hormone could bring ewes into heat in the spring. Only 5 to 10 percent of the ewes became pregnant in those studies, but subsequent research with two other hormones improved the pregnancy rates.

Later, scientists showed that ewes should get a combination of progesterone and estrogen, both female hormones, about 18 days before receiving the ovulating hormone. Then, starting 14 days before the ovulating hormone is administered, ewes should be treated with the progesterone for 12 or 13 days.

A second dose of ovulating hormone should be given about 16 days later to provide another breeding opportunity for ewes that did not become pregnant at the first heat.

Progesterone-like hormones for the out-of-season lambing treatments can be either fed with chopped grain or incorporated into alfalfa pellets. But the ovulating hormone must be injected.

Hulet developed a speed-up technique of injecting hormones into the ewe's rump muscle to replace the laboratory method of injecting hormones under the skin. With the new technique and a pistol-grip automatic syringe, Hulet can inject 200 ewes in 20 minutes.■

SONIC BOOMS

Mother Mink and Kits Take Simulated Booms in Stride

SHOCK WAVES THAT simulate sonic booms produced no harmful effects on female mink in recent tests.

ARS undertook this study because many mink breeders believe that sonic booms cause difficulties during the reproductive period of these sensitive animals. The tests were conducted on two commercial mink farms near Christiansburg, Va.

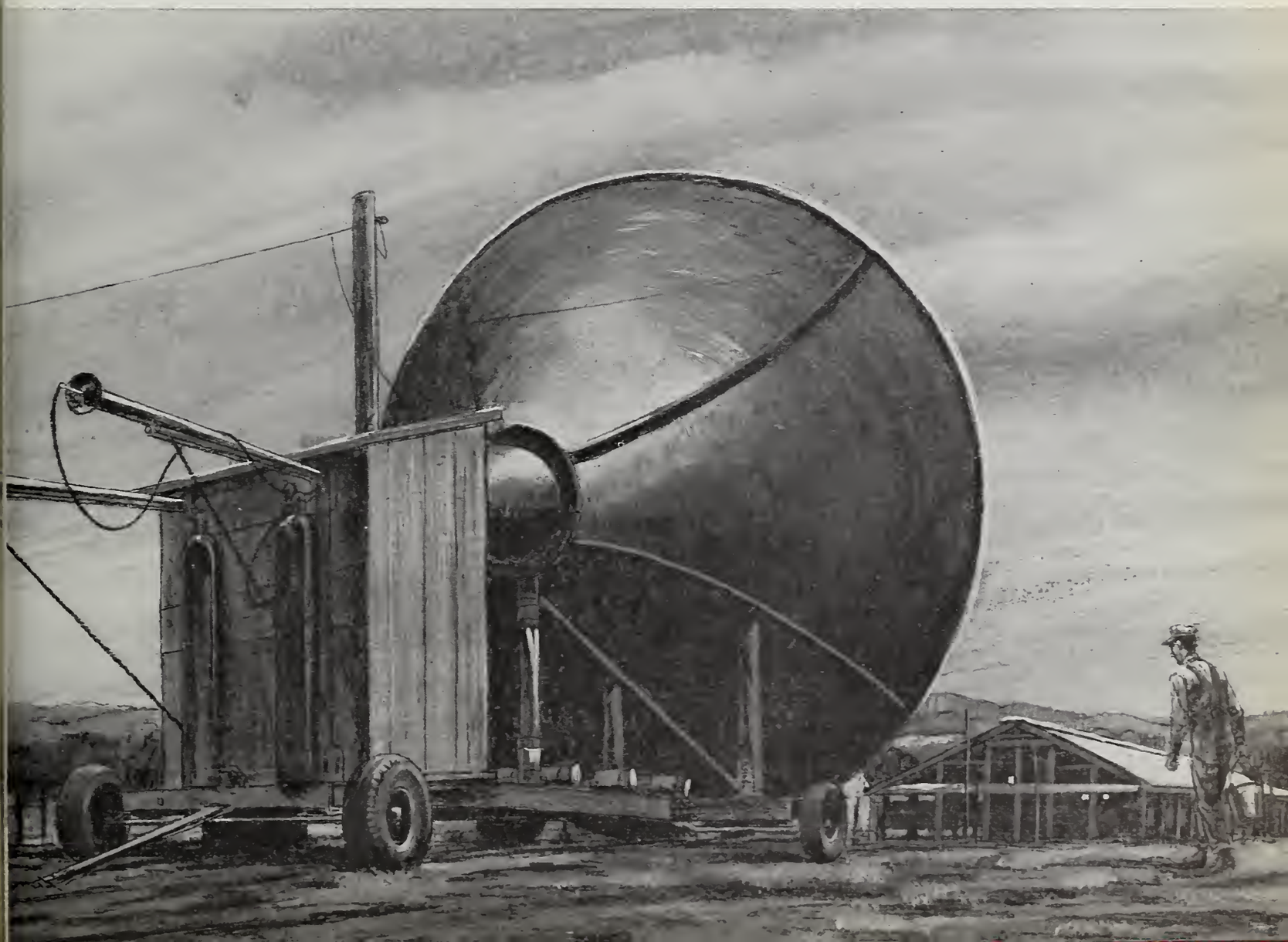
The researchers exposed a group of pregnant and nursing mink to eight simulated booms per day. A control group was exposed to nothing but the usual farm noises.

The mink subjected to booms did as well as those not so subjected, as measured by percentage of females giving birth, number of kits born per female, and percentage of kits surviving. Researchers found no evidence that repeated booming caused mink to be more excitable or nervous, or that any kits died as a direct or indirect result of booming.

The booming device used in the trial was specifically developed for the national sonic boom evaluation program of the U.S. Department of Transportation. The device forces two quick bursts of compressed air through a membrane, and channels the resulting shock waves through a large horn.

This simulates the sudden shifts in atmospheric pressure and the instantaneous crack of noise made by airplanes flying at supersonic speeds. Tentative plans call for similar tests on various farm animals.

ARS researchers participating in the study were mink specialist H. F. Travis, animal physiologist James Bond, agricultural engineer J. R. Menear, and biometrician G. V. Richardson.



Temporarily restricted heifer on right almost caught up in weight with her continuously fed twin in 84 days (BN–29909).

Beef Heifers Bounce Back on
COMPENSATORY FEEDING
If Regular Rations Run Low

If the feed supply runs low just after replacement beef heifers come into puberty, will temporary limited feeding hurt their later performance?

No, says ARS nutritionist James Bond, provided the heifers get good rations before the breeding season starts.

In one test involving twin heifers, Bond held the body weight of 12-month-old heifers to 400 pounds for 112 days. He then gave these heifers free access to feed.

After 84 days of unrestricted feeding, the heifers had gained 256 pounds and more than caught up in weight with their twins, which had been fed to maintain constant gains on good feed throughout the 196-day trial. During the same 84-day period the continuously growing heifers added only 104 pounds.

Once heifers on restricted diets got free access to feed, they gained weight more efficiently than the others: 5.3 compared to 9.3 pounds of feed per pound of gain. Furthermore, after the feeding trial ended and the breeding season began, the temporarily restricted heifers became pregnant as readily as the continuously growing heifers. Both groups of heifers had normal estrous cycles throughout the trial.

In a second test, Bond continued feeding heifers a restricted diet until they stopped having estrous cycles, which took an average of 133 days. Heifers started cycling again after an average of 204 days of good feeding. Bond says that this delay is much too risky for a rancher to assume.

These findings reemphasize that for maximum conception, heifers should be gaining weight as they go into the breeding season. If the feed supply runs low several months before the breeding season—with the prospect of adequate feed later—maintenance rations could be fed for a short time. But purposeful and extended underfeeding, as in the second ARS trial, can cause real problems and is not recommended.■

Preventing Digestive Upsets on Restricted Rations

Three separate daily meals of all-grain rations prevented the usual digestive problems that plague heifers on limited feed.

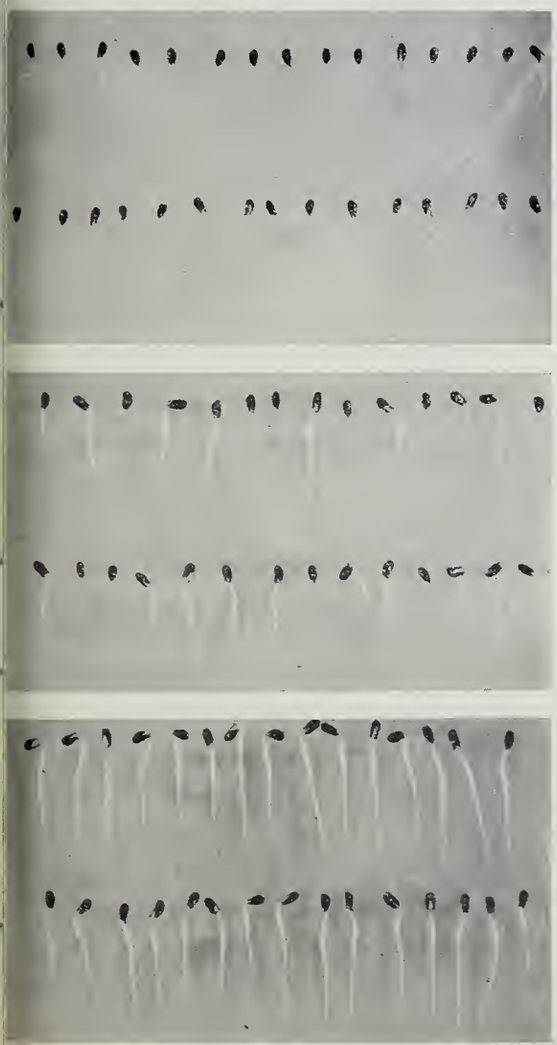
This is a related finding of nutritionist James Bond's study of heifers on restricted diets. It extends earlier ARS beef cattle research which showed that all-grain rations could be fed on an unlimited basis to beef steers without causing bloat or other problems (AGR. RES., Sept. 1965, p. 4). Cattle on a limited all-grain diet get these digestive upsets because they tend to overeat when fed once daily.

Heifers on the restricted diet were divided into two groups. One group received a diet containing 30 percent hay and 70 percent grain concentrates, while the other received all-grain rations based on corn. After 112 days on limited feed, they received the same rations as before but without restriction for 84 days.

During the entire 196-day feeding period, both groups gained the same amount of weight, although the heifers on all-grain ration ate less feed and therefore gained weight more efficiently.

Chilling of cotton seed at time of germination causes "nub root" and poor cotton stands (PN–1650).

Soaking treatments protect cotton seeds against chilling injury. Seeds in top photo were not soaked; those in middle and bottom photos were soaked 2 and 8 hours at temperature of 88° F. (PN–1651).



A soak in time . . .

Rx for Seed Chilling Injury

A TYPE OF CHILLING injury to cotton and lima beans can be prevented by giving seeds simple soaking treatments.

These ARS findings could lead to treatments for preventing chilling injury to other crops.

Chilling injury occurs if seeds are planted at a favorable temperature, and the temperature suddenly drops 15 degrees or more. It also occurs when seeds germinate at a low and unfavorable temperature.

Plant physiologist M. N. Christiansen, working with cotton seeds at Beltsville, Md., found that soaking seeds for 1½ minutes in water at 180° F. and allowing them to dry slowly prevented "nub root," a type of injury that results from chilling at the time of germination. This injury is one of the important causes behind poor cotton stands. It causes reduced growth and vigor of the plants, and makes them very susceptible to water and nutrient stresses.

The new treatment is commercially feasible since seed growers already use a hot-water treatment to overcome a water-impermeable condition of some cotton seeds.

On a smaller scale, farmers can achieve the same "inoculation" that Christiansen obtained by soaking their seeds for 8 hours at room temperature, then allowing them to dry until they are suitable for storage.

Related experiments conducted by plant physiologist B. M. Pollock, in cooperation with the Colorado Agriculture Experiment Station, Fort Collins, explain in detail the chilling effect on Thorogreen lima beans. His work could lead to a more accurate check of the germination potential of seeds by testing laboratories.

Pollock's studies show that a seed with a relatively high moisture content (13 percent) can withstand chilling without injury better than one with a relatively low (9 percent) moisture content.

By determining the moisture content of a seed sample, testers could provide information on the germination percentage under various field conditions. If the seeds were "dry," growers could raise the internal moisture slightly as a precaution against chilling injury in the field.

In his experiments, Pollock learned that the lima bean can be injured by even moderately low (59° F.) temperatures at the critical time immediately after the seed begins to absorb water for germination. If the seed has a sufficiently high moisture content at this time, it will not be injured by soil temperatures that would damage a drier seed.

Pollock suggests that some structure in the seed, possibly a cell membrane, may be stabilized by the high moisture content obtained from soaking and thereby be made resistant to injury from low temperatures. ■

The roller packs sandy soils into ridges and dams to form moisture-retaining pockets (PN–1652).

Microridge Roller

Prepares Better Seedbeds on Wind-swept Great Plains

A NEW MICRORIDGE roller may help rehabilitate abandoned croplands in the central Great Plains.

The roller firmly packs sandy soils into ridges, thus helping prevent wind erosion and moisture loss during seed establishment. It was built by ARS range scientists D. N. Hyder and R. E. Bement, in cooperation with the Colorado Agricultural Experiment Station, Fort Collins.

Barren, sandy soils are difficult to seed because wind erosion is high and rainfall low. The rapid loss of soil moisture often subjects new grass to severe drought before the roots are deep enough to reach moist soil. Other mechanical methods of seedbed preparation do not provide adequate protection from wind erosion, and chemical methods are too expensive.

Hyder and Bement built their microridge roller from steel welded into a single unit and filled with concrete. A seed planter can be attached. The roller packs soil firmly into adjacent ridges 4 inches high, 12 inches apart. Cut-aways in the roller sections leave dams across the rows. The dams close the rows into about 5-foot pockets which can catch water and help retain soil moisture while combatting wind erosion. The new microridge roller operates effectively at speeds up to 4 miles per hour.

A previous microridge roller built by Hyder and Bement was made of concrete and pressed the soil into 4-inch flat sections divided by ridges. It did not provide for dams within the ridges, and did not function properly when operated faster than 1 mph. However, crested wheatgrass planted on soil prepared by this roller developed rapidly.■

Lime vital when fertilizing Coastal Bermudagrass

SOUTHEASTERN STOCKMEN may benefit from a study which indicates that heavy nitrogen fertilization without liming damages or even kills acid-soil tolerant Coastal bermudagrass.

Tests conducted on irrigated plots by ARS soil scientists W. E. Adams and R. W. Pearson, showed that such fertilization decreased soil pH, or in other words, it increased the acidity of the soil.

To raise pH in subsoil, the soil scientists added limestone, which reacted with the nitric acid produced in the soil to form calcium nitrate. Nitric acid results from nitrification (oxidation) of ammonium nitrate in the fertilizer.

When high rates of nitrogen are applied to limed soils, not all calcium nitrate is absorbed by roots. Some moves into the subsoil following rain or irrigation. During this movement, preferential uptake of nitrate results in calcium hydroxide which neutralizes subsoil acidity.

Without lime, soil pH was reduced at all nitrogen rates ranging from 0 to 1,600 pounds per acre. The highest rate reduced pH to 4.2 in the surface 6 inches and to 4.0 in the 3-foot soil profile.

Application of 18 tons of lime per acre increased forage production as nitrogen application rates increased. Forage yields on an oven-dry basis were nearly 14 tons per acre at the 1,600 pounds per acre nitrogen plus lime level.

Mixing 18 tons of lime in the surface 6-inch layer and 800 pounds of nitrogen per acre raised pH to 6.1.

At 1,600-pound nitrogen rate without lime, 90 percent of the plants died within 2 years; at the 800-pound nitrogen rate, 75 percent were dead at the end of 3 years.

The Georgia Agricultural Experiment Stations cooperated in this research project.■

AGRISEARCH NOTES

Screwworm barrier expanded

Screwworm reinfestation of the United States is being prevented by drops of sterile screwworm flies over an expanded area of Mexico where the insect can live the year around.

Expansion of the barrier zone is being made possible by the use of larger cartons to package the sterile flies. These larger cartons can hold about 2,000 flies each compared to about 400 for the smaller cartons that have been used since the screwworm eradication program began.

Use of these larger cartons enables planes to fly wider paths—10 miles wide compared to 2 to 5 miles wide. The combination of larger cartons and wider paths permits coverage of larger areas in Mexico with the same or even higher concentrations of sterile flies because of decreased flying time.

Virtanen gives Atwater lecture

Dr. Artturi I. Virtanen, Nobel prize-winning Finnish chemist, presented the first in a series of lectures sponsored by ARS—the Atwater Memorial Lecture. The lecture was given at the annual meeting of the Federation of American Societies for Experimental Biology, in Atlantic City, N.J.

Dr. George W. Irving, Jr., ARS Administrator, introduced Dr. Virtanen and presented him the Atwater Memorial plaque, honoring USDA's first chief of human nutrition research, Dr. Wilbur O. Atwater.

Dr. Virtanen, Director of the Biochemical Institute in Helsinki, Finland, has directed much of his research toward improving human nutrition. His investigations—like those of Dr. Atwater, "Father of Human Nutrition" in the United States—underscore his convictions that protein is indispensable to mental as well as physical health.

Alfalfa fungus in Minnesota

A fungus which attacks alfalfa roots and eventually kills the plants has been observed in Minnesota. The fungus, *Phytophthora megasperma*, a new problem for alfalfa growers, was spotted earlier in California, Illinois, Ohio, and Mississippi.

ARS plant pathologist F. I. Frosheiser isolated the fungus from diseased alfalfa roots brought to his laboratory at the University of Minnesota.

Frosheiser says that *Phytophthora megasperma* is present in most of Minnesota's heavier soils, and it will damage alfalfa in poorly drained soils during periods of prolonged rainfall. Adaquate drainage, however, discourages fungus growth.

Symptoms of Phytophthora root rot are wilted plants and thinning alfalfa stands. Dark lesions appear on the roots, followed by rotting of the tap roots. When the tap root has rotted away, the plant dies. However, if the moisture level of the soil is reduced before the tap root rots, diseased plants will recover.

The best control of Phytophthora root rot can be achieved with resistant varieties of alfalfa. ARS scientists have developed several varieties which are now under test for resistance.

For the present, however, adequate drainage is the only way to prevent Phytophthora root rot.

Irving (left) presents Atwater plaque to Virtanen. Virtanen spoke on aspects of current nutritional problems and discussed methods under development for increasing protein production (BN-32049).

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AGRISEARCH NOTES

Better crops for Vietnam

Amidst a hotly contested military war, the South Vietnamese Ministry of Agriculture and a team of ARS crop scientists have waged another kind of war—one against hunger and malnutrition.

Their major campaign has been the introduction of high-yielding, short-strawed rice developed by the International Rice Research Institute in the Philippines. Acreage figures for the country point up the importance of this crop: rice is planted on 83 percent of the cultivated land in South Vietnam.

Early this year, nearly a thousand acres of one short-strawed rice variety, IR–8, were harvested in South Vietnam and the seed distributed for planting. Harvests of IR–8 on experimental plots yielded about 3,150 pounds per acre compared to local yields of about 1,800 pounds per acre.

In addition to rice, 42 U.S. sorghum varieties and hybrids have been

planted to test the potential of sorghum as a second crop on riceland idle during the dry season. This crop rotation could be an important source of much needed feed for swine and poultry.

Corn, tomato, chickpea, cantaloup, strawberry, watermelon, and mungbean varieties are also being tested to supplement the Vietnamese diet.

The Crops Research Division, Beltsville, Md., has strongly supported the ARS team by forwarding needed reference works and seed varieties. The ARS mission has been funded by the U.S. State Department's Agency for International Development.

Toward sweeter sweet corn

By altering the gene pattern of commercial sweet corn, geneticists hope to produce "sweeter" sweet corn.

Recent studies by ARS geneticist E. V. Wann show that the mutant genes *amylose extender* (*ae*), *dull* (*du*), and *waxy* (*wx*) enhance the eating qualities and shelf life of fresh corn. Present commercial sweet corn hybrids lose quality during postharvest handling by transforming most of their sugar into insoluble (nonsweet) carbohydrates before the corn can reach the kitchen table.

Wann says that by breeding sweet corn varieties that contain more sugar initially, more sugar should be present when the corn is eaten. His experimental hybrids had a higher sugar content at harvest and were still sweeter than commercial sweet corn after 7 days of storage at 62° F. Kernals of these hybrids also maintained a fresh appearance longer than those of commercial sweet corn.

Wann now hopes to combine mutant genes that improve quality with those that produce a sturdier plant that is free of suckers and has high yielding ability. Corn from such plants would ship with less quality deterioration. And harvesting time could be extended because the corn would be in its prime stage longer.

Inverted peanuts dry faster

Peanuts dry faster and more uniformly when turned upside down in windrows than if dug and windrowed in random fashion.

The inverted windrows offer the advantages of better exposure for drying, less chance of molding, and reduced harvesting losses.

ARS agricultural engineer G. B. Duke is developing equipment that will dig up peanuts and place them upside down in windrows in the same step. Most diggers now used place peanuts only in random windrows.

Duke is conducting tests in Virginia, where peanuts usually contain 50 to 55 percent moisture when freshly dug. Normally, combining is delayed 4 to 8 days; this allows peanuts to dry to a 25- to 35-percent moisture level. Peanuts in inverted windrows contain about 10 percent less moisture after the 4- to 8-day waiting period.

If high-moisture peanuts are placed underneath the windrow and in contact with the ground, which happens frequently in random windrowing, they may mold during damp or rainy weather. Moreover, losses may increase during combining due to the weakening of stems which connect pods to plants.

The data Duke reports are from tests at the Tidewater Field Station, Holland, Va., but conditions are similar in other peanut-growing States. Peanuts are now combine-harvested in all the major peanut-growing States: Virginia, North Carolina, Georgia, Florida, Alabama, Texas, and Oklahoma.

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